Putting Advanced Transportation Technologies to Work for Clean Air and Energy Security

The Mobile Source Technical Review Subcommittee

April 18, 2001

David Rodgers

U.S. Department of Energy

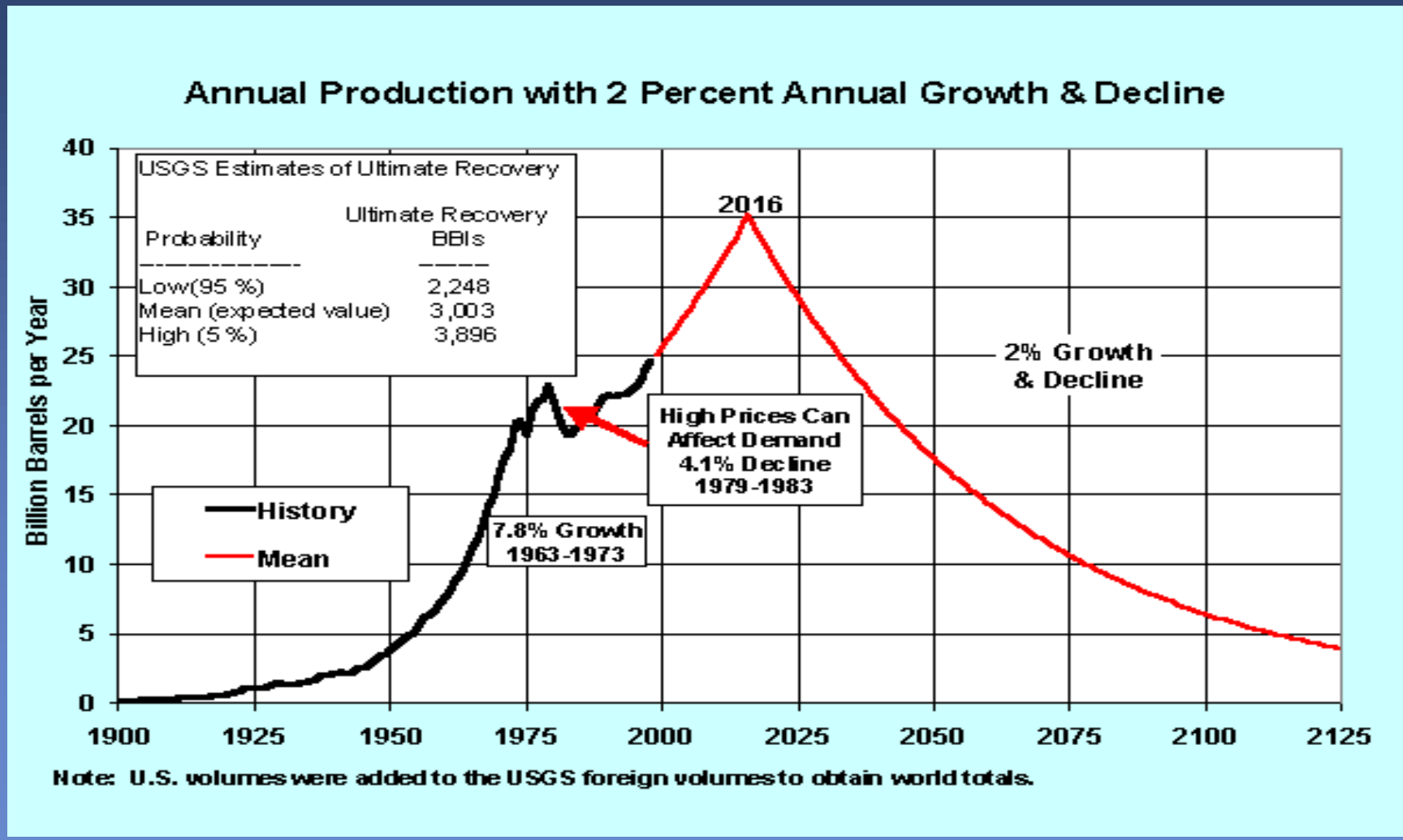
Overview

- Why Use Alternative Fuels?
- What Alternative Fuel Vehicles are Available Now?
- Alternative Fuel Vehicle R&D Challenges
- Advanced AFVs and Hybrid Vehicles
- Vision for Transportation Deployment Programs
- Selected Transportation Deployment Policies
- The Energy Policy Act (EPACT)
- Federal Promotion of Clean and Efficient Vehicles

Why Use Alternative Fuels?

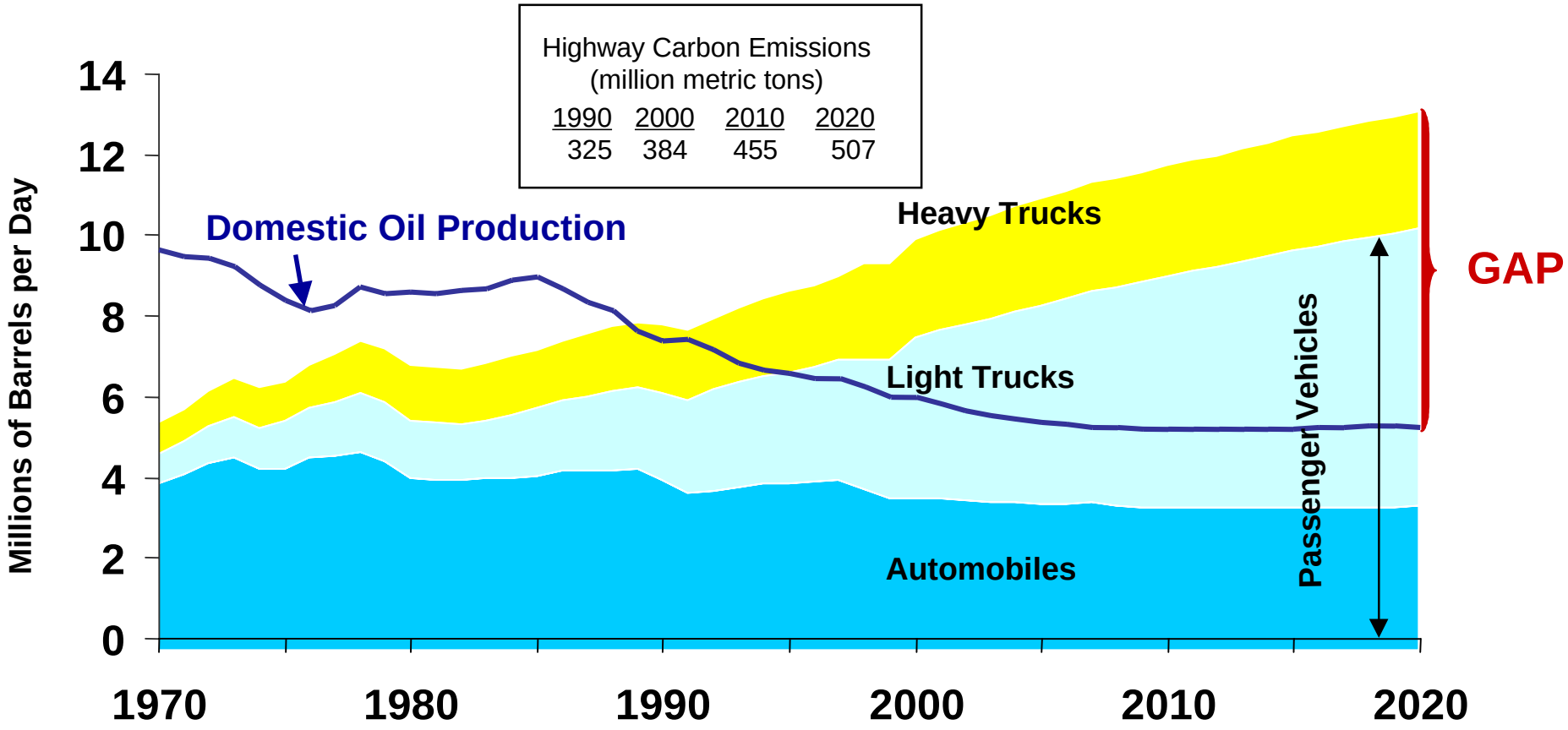
- Petroleum Displacement
- Energy Diversity
- Air Quality Improvement
- Greenhouse Gas Emission Reductions
- Domestic Economic Development

Estimated World Oil Supply



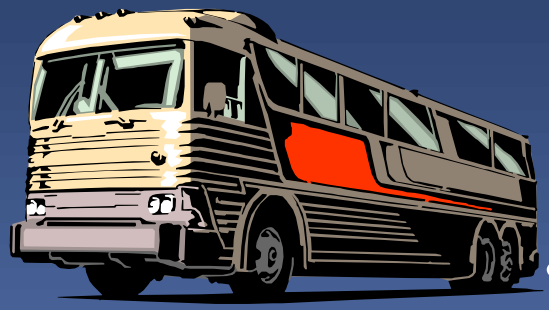
Source: EIA, Long Term World Oil Supply, July 28, 2000.

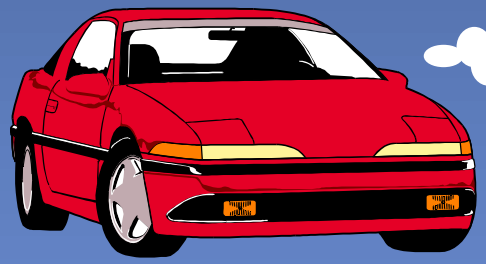
U.S. Transportation Oil Demand

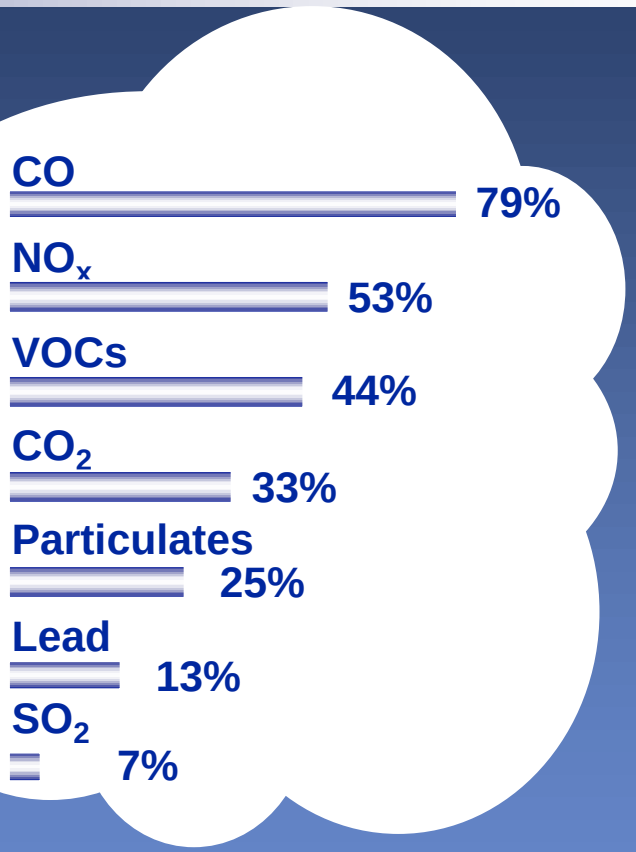


Source: Transportation Energy Data Book: Edition 19, DOE/ORNL-6958, September 1999, and EIA Annual Energy Outlook 2000, DOE/EIA-0383(2000), December 1999

Transportation Share of Emissions



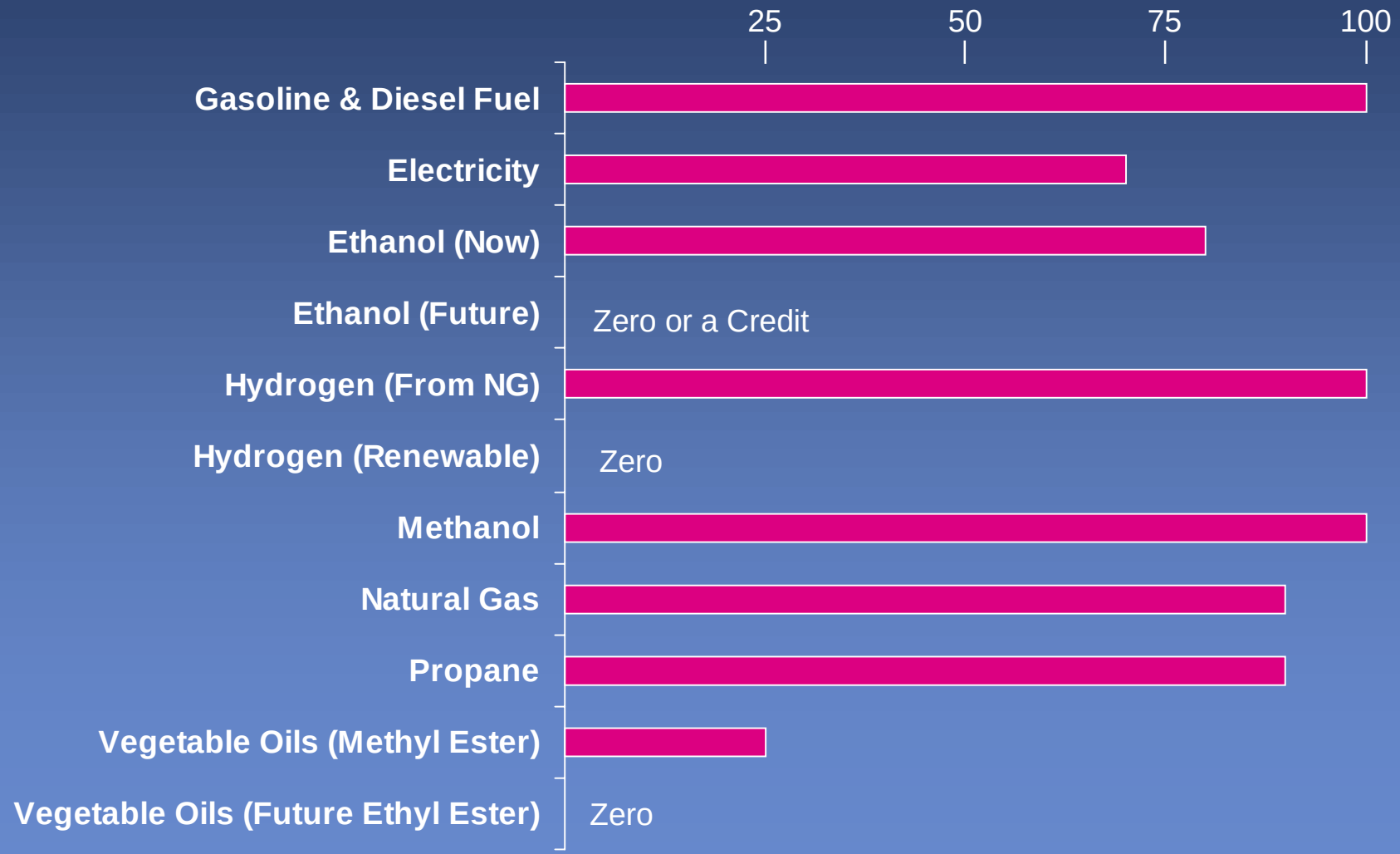




- **Still a major contributor, despite reductions in new vehicle emissions achieved over the last decade**

Source: EPA

Relative Greenhouse Gases



Summary of Present Situation

- **The U.S. Transportation Sector:**
  - **Is 95% dependent on petroleum;**
  - **Accounts for 67% of all U.S. petroleum use;**
  - **Produces a significant share of U.S. pollutant releases;**
  - **Has major impacts on consumers, the economy, and the national trade balance;**
  - **Currently has no readily available alternative to petroleum; and**
  - **Has limited infrastructure to support alternative fuels.**

Alternative Transportation Fuels

- Electricity
- Ethanol
- Hydrogen
- Methanol
- Natural Gas
  - Compressed
  - Liquefied
- Propane
- 100% Biodiesel
- P-Series

Alternative Fuel Vehicles Available Now

- Electric
- Ethanol
- Natural Gas
- Propane

Electric Vehicles

- Low Emissions
- Quiet
- At least 4% of new vehicles sold in California starting in 2003 must be EVs

- Expensive
- Limited Range

Ford Ranger

Toyota RAV4

Ethanol Vehicles

- Low GHGs
- Less Reactive
- Subsidy Required to be Cost Competitive
- Few Refueling Stations but Numbers Increasing

Ford Taurus

Ford Ranger

Chrysler Minivan

Ford Crown Victoria

Natural Gas Vehicles

Ford F-150

- Very Low Emissions
- Good Performance
- Lower Cost Fuel

- Limited Range, but Adequate for Most Applications
- Few Refueling Stations
- Higher Cost Vehicle

Honda Civic

New Flyer D40 LF Bus

Propane Vehicles

- Low Emissions
- Good Performance
- Cost Similar to Gasoline

- Few Typical Refueling Stations, Many Potential Places to Refuel
- Higher Vehicle Cost

Ford F-150

Ford Club Wagon

Alternative Fuel Vehicle R&D Challenges

- EV Batteries
- Ethanol Production from Cellulose
- Reduce Natural Gas and Propane Vehicle Cost
- Expand Refueling Infrastructure
- Hydrogen Production (for Fuel Cell Vehicles)

Potential Future AFV Technology

- Hydrogen Fuel Cell Vehicles
- Direct Methanol Fuel Cell Vehicles
- High Efficiency Direct Injection Engines for Light- and Heavy-Duty Vehicles

Fuel Cell Ford Focus

Fuel Cell Mercedes A-Class

Hybrid Passenger Cars

- DOE programs have spurred interest in hybrid vehicle technologies
- Two models currently available
  - Toyota Prius (48 mpg)
  - Honda Insight (64 mpg)
- Potential for very low emissions
- Represent a "Spin-Off" of technology developed for EVs
- Good potential for petroleum conservation

Toyota Prius

Honda Insight

Vision for Transportation Deployment Programs

- A sustainable alternative fuel infrastructure
- Widespread availability of AFV and ATV products
- True acceptance of diverse fuels and technologies in national/regional/local transportation portfolios
- Cost-competitive technologies and fuels in a variety of markets
- A diverse fuel supply for transportation
- A change in societal norms leading to demand for clean and efficient vehicles

Long-term Outcomes

- Billions of gallons of oil displaced or reduced
- Thousands of tons of emission reductions
- Tens of millions of AFVs and ATVs
- Enhanced energy security and improved transportation sustainability

Deployment Strategies

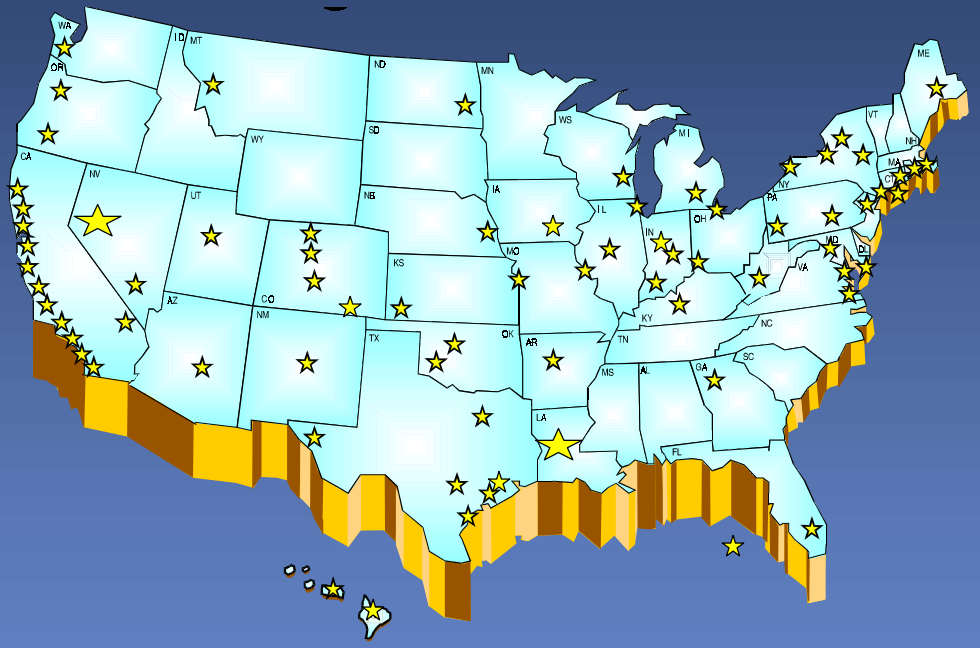
- Understand the market
- Develop and provide unbiased information
- Offer technical and financial assistance
- Develop, issue, and enforce regulations
- Find and support partners
- Conduct mission advocacy

OTT Deployment Portfolio

- **Clean Cities**: A voluntary Federal program designed to accelerate and expand the use of alternative fuel vehicles in communities across the country
- **Testing and Evaluation**: In partnership with industry, validate the performance and emissions of near market-ready advanced technology vehicles
- **EPACT Replacement Fuels**: To implement the requirements of EPACT, collect data, perform analysis, prepare reports to Congress, and prepare, issue, and enforce needed regulations
- **Advanced Vehicle Competitions**: Student competitions, such as the FutureTruck Challenge and the Ethanol Challenge, provide an unparalleled education in automotive engineering and push the envelope of advanced vehicle technologies

Clean Cities Program Accomplishments

- 79 Designations
  - 2 new in 2000
    - Baton Rouge
    - Truckee Meadows
  - 3 Designations Scheduled in 2001
    - Triangle, NC (March 19)
    - Twin Cities, MN (April)
    - Vermont (June)
- More than 4,400 stakeholders
- 115,000 AFVs
- More than 5,000 refueling stations
- 102 million gallons of petroleum displaced per year
- 19,000 metric tons of emissions reduced per year



Evolution of Deployment Activities

Reducing

- AFV emissions testing
- AFV case studies
- Light-duty fleets
- Analysis of AFV options
- Neat fuels only

Increasing

- Hybrid vehicle testing
- Fuel-efficient vehicles
- Niche markets
- Analysis of future fuels
- Blended fuels

Selected Transportation Deployment Policies

Policy	Year	Regulations & Standards	Financial Incentives	Information
EPCA (CAFE)	1975	☑		☑
AMFA	1988	☑		☑
EPACT	1992	☑	☑	☑
ISTEA & TEA-21	1991 & 1996		☑	

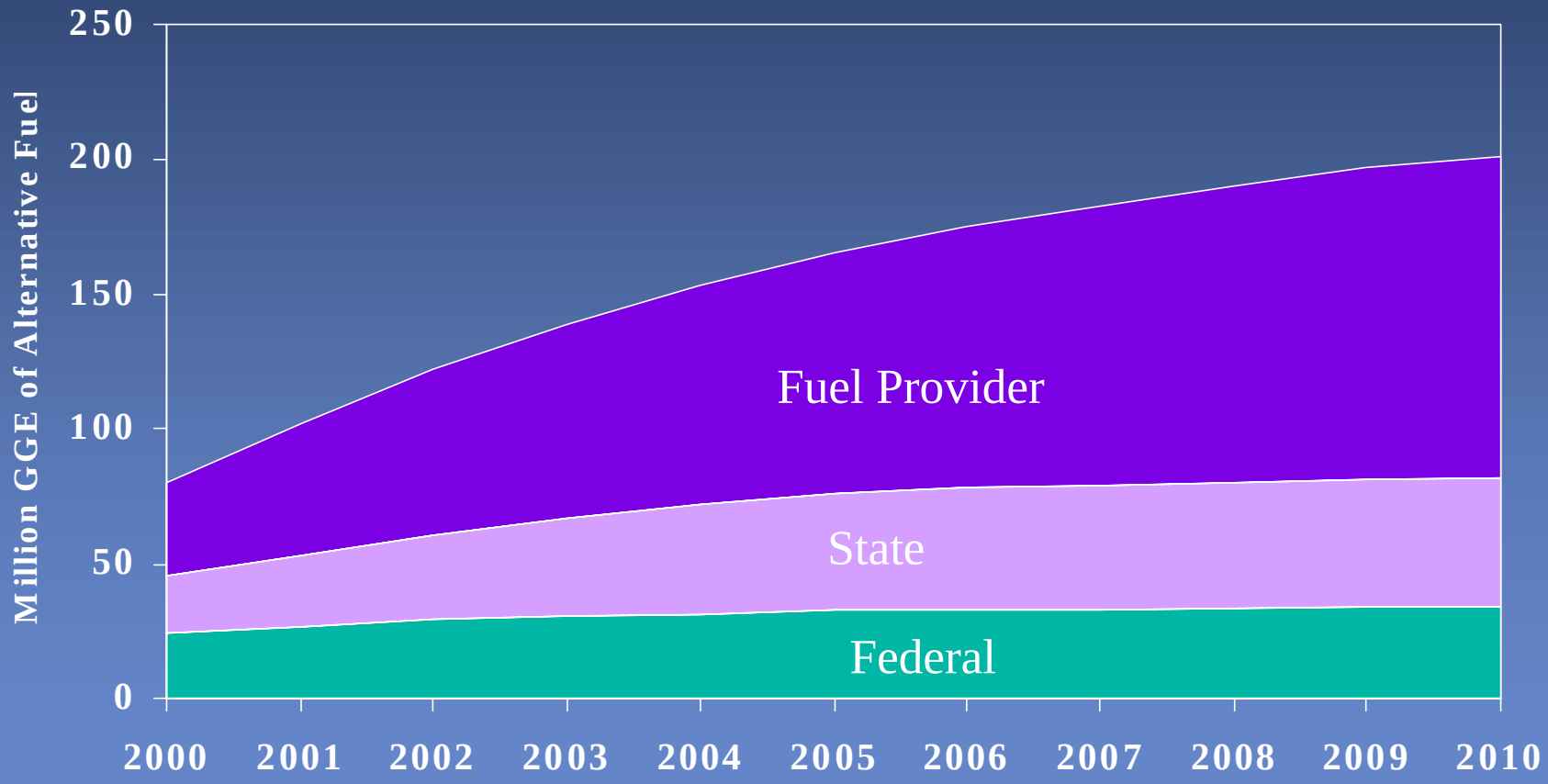
The Energy Policy Act

- Set a goal – 10% by 2000 and 30% by 2010
- Voluntary programs
- Public Information
- Fleet mandates
- Grants and incentives

Assumptions in 1992 EPACT

- Barriers to alternative fuels are primarily informational
- The vehicle mandates solves the chicken/egg problem
- Fleets are uniform, centrally refueled, and easily regulated
- Small tax incentives and grants are sufficient to push the market
- Fuel providers will be the leaders in AFV use
- Saying we have a goal is all that's needed

Results Heading In Right Direction

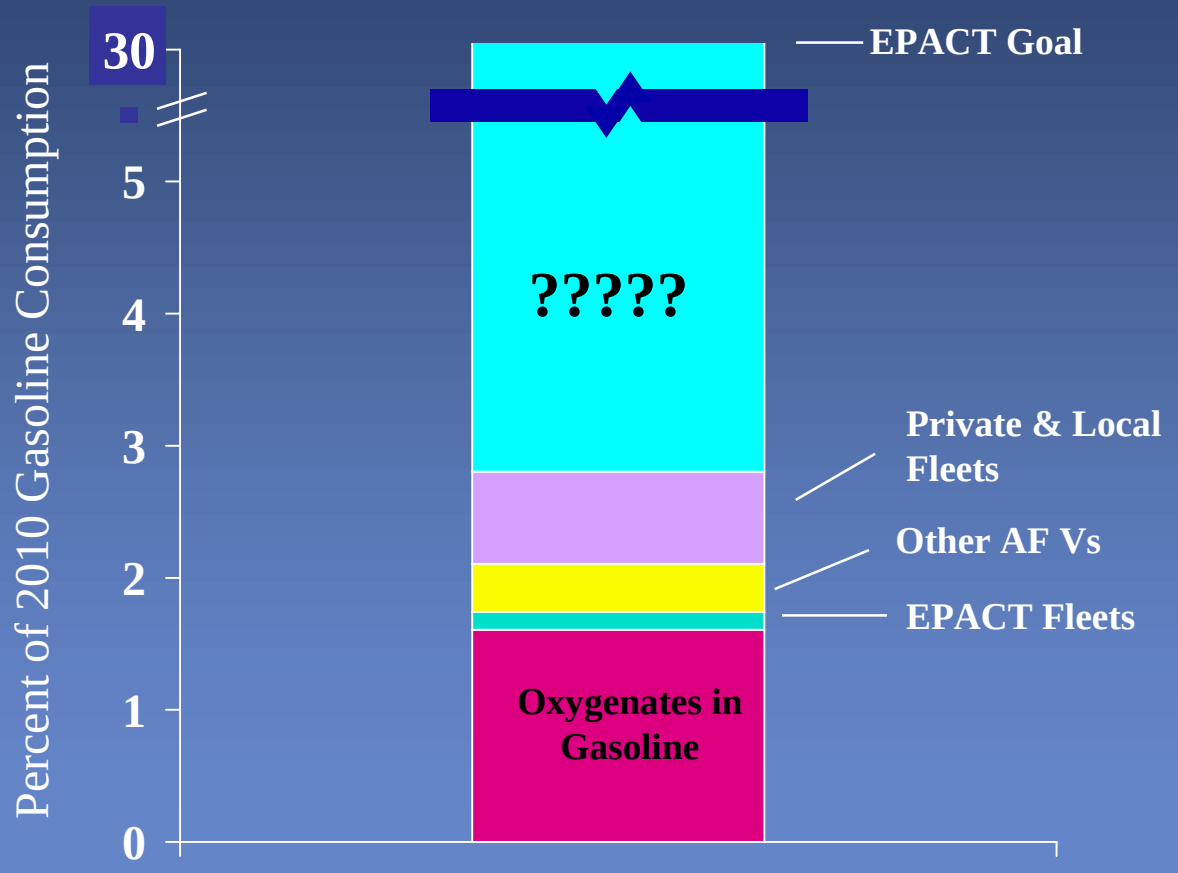


Other Parts of EPACT Working Too

- Clean Cities has 80 participants - thousands of vehicles
- Public information on AFVs widely available
- Refueling stations have grown
- Dozens of AFVs offered by OEMs
- U.S. AFVS among the best in the world

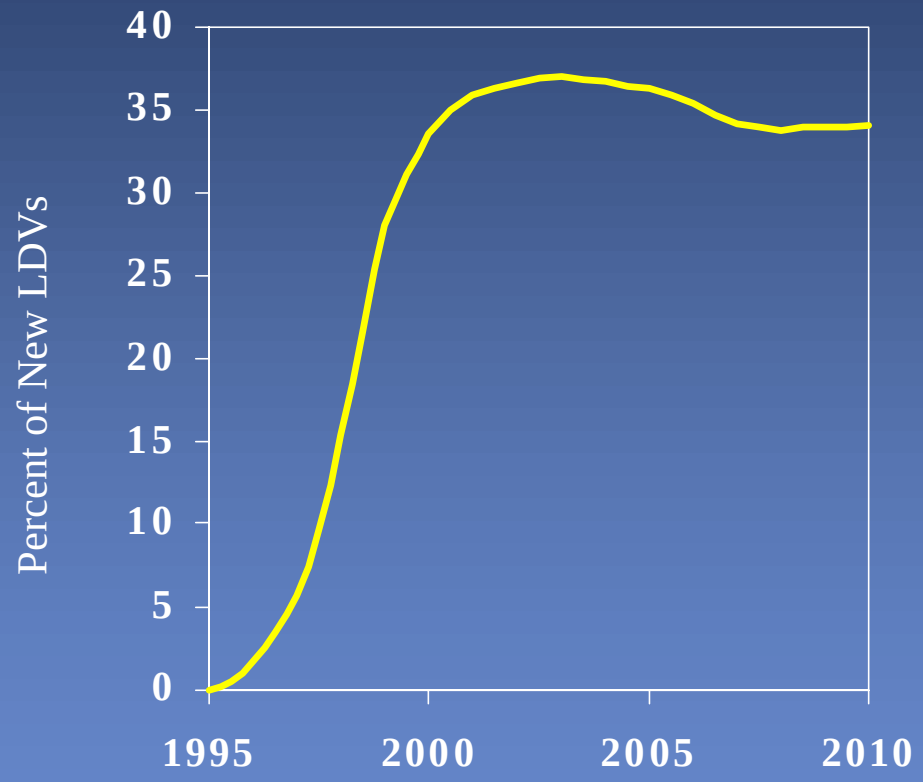
But not good enough to meet the EPACT 30% goal for 2010

- 30% is about 30-40 Billion gallons
- Oxygenates in gasoline are predicted to continue
- Existing EPACT fleets and other AFVs contribute about 0.4%
- Including Private & Local Fleets in EPACT could add at most 0.7% by 2010



What Had to Have Happened to Meet EPACT Goals

- **To meet the EPACT goals would have required:**
  - **about 6% of all LDVs in 2000 to be AFVs**
  - **about 35% of all new LDVs in 2000 and beyond to be AFVs**



Federal Promotion of Clean and Efficient Vehicles

- Recognition of important Federal role
  - Regulation may be necessary
  - Incentives may be necessary
  - Consumer education will be necessary
- Comprehensive program
  - Multiple market segments
  - Multiple technology options
- Coordination and partnership
- Long term commitment

Contacts at the Department of Energy Office of Technology Utilization

David Rodgers	Director, Tech. Utilization	202-586-9118	David.rodgers@hq.doe.gov
Linda Bluestein	EPACT regulations	202-586-6116	Linda.bluestein@hq.doe.gov
Shab Fardanesh	Federal fleet	202-586-7011	Shabnam.fardanesh@hq.doe.gov
Christy Ficker	Green Vehicle Promotion	202-586-8791	Christy.ficker@hq.doe.gov
Shelley Launey	Clean Cities Director	202-586-1573	Shelia.launey@hq.doe.gov
Dana O'Hara	EPACT regulations	202-586-8063	Dana.ohara@hq.doe.gov
TG Powell	Clean Cities & Student Competitions	202-586-8077	Tg.powell@hq.doe.gov
Marcy Rood	Clean Cities & International	202-586-8161	Marcy.rood @hq.doe.gov
Lee Slezak	Testing & Evaluation	202-586-2335	Lee.slezak @hq.doe.gov
Dennis Smith	Clean Cities Niche Markets	202-586-1791	Dennis.smith @hq.doe.gov
Dorothy Wormley	Clean Cities Grants	202-586-7028	Dorothy.wormley @hq.doe.gov

Resources at the Department of Energy

- Clean Cities
  - 1-800-CCITIES
  - http://www.ccities.doe.gov
- Alternative Fuels Data Center
  - Alternative Fuels Hotline 1-800-423-1363
  - http://www.afdc.doe.gov
- Fuel Economy Guide
  - http://www.fueleconomy.gov
- EV and Hybrid Test Data
  - http://www.ott.doe.gov/otu/field_ops
  - http://www.ott.doe.gov/hev